

REMARKS/ARGUMENTS

Claims 1-18 and 20-42 are currently pending in this application. Claims 1, 7, 21, 27 and 29 have been amended herein.

Claims 1-2, 7-10, 12, 14, 21-25, 27-35 and 37 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,988,971 to Fossey (“Fossey”). Claims 3-4 and 39-40 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Fossey in view of U.S. Patent No. 6,024,393 to Shamlou et al. (“Shamlou”). Claims 5-6 and 41-42 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Fossey. Claims 11, 13, 15-16 and 36 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Fossey in view of U.S. Patent No. 6,454,332 to Govzman et al. (“Govzman”). Claims 17-18, 20 & 26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Fossey in view of U.S. Patent No. 6,164,894 to Cheng (“Cheng”). Claim 38 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Fossey in view of U.S. Patent No. 6,040,585 to Hsiao (“Hsiao”).

Applicant’s Claimed Invention

Applicant’s invention is directed to a system for handling substrates such as semiconductor wafers held in a carrier, the system including an end effector attached to a moveable end of a robotic arm. The end effector includes a blade having a first end and a second end, and an active area configured to measure a distance between the substrate and a critical plane defined by the first and second end. A passive gripper is attached to the first end of the blade and an active gripper is attached to the second end of the blade for gripping the substrate. The end effector further includes a mapping sensor disposed on the articulated robotic arm, the

mapping sensor configured to determine the position and orientation of the substrate within the carrier.

Independent claim 1 recites, among other things, a mapping sensor, disposed on an articulated robotic arm and configured to determine the position and orientation of the substrate within the carrier, and an active area of the blade configured to measure a distance between the substrate and the critical plane. Independent claim 29 recites, among other things, a mapping sensor configured to determine the position and orientation of the substrate, and an active area of the blade for sensing a distance between the substrate located along the blade and the critical plane. Independent claim 21 recites, among other things, a mapping sensor that determines coordinate information of the substrates in the carrier, and a substrate sensor that measures a distance between the substrate and the critical plane. Independent claim 23 recites, among other things, a mapping sensor that records mean vertical substrate locations and a substrate sensor that measures a distance between the substrate and the critical plane.

Response to Rejections

The Examiner has rejected independent claims 1, 21, 23 and 29 under 35 U.S.C. § 102(b) as being anticipated by Fossey. Anticipation under 35 U.S.C. § 102 requires each and every limitation of the claim to be disclosed in a single prior art reference, either expressly or inherently. The anticipating reference must disclose the elements in the arrangement called for by the claim. If any limitation of the claim is missing, the reference does not anticipate.

Applicant respectfully traverses the rejection and submits that independent claims 1, 21, 23 and 29 are patentable over Fossey because Fossey, alone or in combination with any of the other references cited, does not show or suggest a mapping sensor as recited in the claims.

The Office action states that Fossey discloses a “mapping sensor” shown as 61 in the drawings of Fossey. The sensor(s) of Fossey are described in column 6, lines 15-20, as “a pair of downwardly-looking capacitance sensors 61 mounted in the lowermost edge of the paddle 21...” (emphasis added). Fossey further describes the function and operation of sensor 61 as sensing “the presence of the reference target 55 and thus confirm[ing] that the robot is at the proper position opposite the wafer cassette. The paddle 21 is then moved in the y-axis toward the front of the machine and across the top of the cassette, which allows the downward looking sensors 61 to scan each slot location, sensing the presence or absence of the wafer’s upper edge at each slot. In this manner, the system ‘maps’ the presence or absence of the wafers in each respective slot of the cassette” (emphasis added). Applicant respectfully submits that the term “mapping,” as used throughout the specification of Fossey, means a binary detection method in which the sensor output consists only of an indication of whether a wafer is present or absent.

The sensors 61 disclosed in Fossey sense the presence or absence of an object including the wafer. The sensor outputs a binary result – either a wafer is present or it is not. The “mapping function” of Fossey is a yes/no function that only detects whether or not a wafer is present in a particular location. The downwardly looking capacitance sensors do not measure the position and orientation of the substrate within the carrier.

The present invention, separate and distinct from an active area or a substrate sensor, utilizes a mapping sensor configured to determine to the position and orientation of the substrate

within the carrier. As disclosed in paragraphs 0061-0062 of the specification, the mapping sensor provides the capability for mapping the location of the substrates positioned within input cassettes. Output is obtained from the mapping sensor, e.g., at 1 millisecond intervals, which provides a number of advantages, including providing thickness measurements of all substrates within the cassettes. *See also* Fig. 16.

Claim 1 recites “a mapping sensor disposed on the articulated robot arm, the mapping sensor configured to determine the position and orientation of the substrate within the carrier.” Fossey does not disclose a mapping sensor disposed on an articulated robot arm. The capacitance sensors of Fossey are necessarily embedded into the downward facing edge of the paddle 21. “The downward looking capacitive sensors 61 are received in a slot formed in the lower edge of the paddle.” Col. 6, ll. 43-45. Fossey does not disclose a sensor of any kind disposed on an articulated robot arm. Further, the capacitance sensors of Fossey are not configured to determine the position and orientation of the substrate within the carrier. The Fossey sensors detect the absence or presence of a wafer only.

Claim 21 recites, in part “measuring coordinate information of the substrates in the carrier with a mapping sensor” and “storing the coordinate information.” The capacitance sensors of Fossey do not measure coordinate information, nor does the device store coordinate information. The Fossey sensors “sense the presence” of the wafer, they do not map out and store the physical coordinates of the wafers position and orientation as recited in claim 21. *See* para. 0061-0062, Fig. 16. Applicant respectfully submits that Fossey does not map a vertical location, but instead determines the presence of a wafer through detection, not mapping.

Further, regarding claim 23, Fossey does not disclose recording the mean vertical substrate locations. Fossey determines whether a wafer is present or not; it does not calculate any mean vertical locations.

Similarly to claim 1, claim 29 recites a mapping sensor configured to determine the position and orientation of the substrate. Fossey does not disclose a sensor configured to determine the position and orientation of the substrate within the carrier. The Fossey capacitance sensors detect the absence or presence of a wafer only.

The Office action states that the Fossey sensor 61 “measures position inasmuch as it scans each slot location, sensing the presence or absence of the wafer’s upper edge at each slot to determine a ‘y-axis’ position and orientation.” Applicant respectfully submits that the Examiner’s reading of the Fossey disclosure is incorrect. Nothing in Fossey discloses a sensor that measures or determines a y-axis position. The Fossey sensor determines if a wafer is present or not. It gives no regard to the physical coordinates of the wafer within carrier, only that there is a wafer present. *See* col. 7, l. 64 – col. 8, l. 4. The only mention of a y-axis is in reference to the direction the arm moves during operation, and it does not disclose mapping coordinates in any axis. Further, the sensors cited by the Examiner as sensors “that measure distance by sensing a tilt” are entirely different sensors that are embedded in the paddle and are for grasping the wafer. These sensors are clearly not mapping sensors as claimed in the present application. *See Col 8, ll. 15-20.*

The mapping sensor as claimed in independent claims 1, 21, 23 and 29, is distinguishable from any sensor disclosed in Fossey, which discloses a binary detection sensor. Therefore,

independent claims 1, 21, 23 and 29 are patentable over Fossey, either alone or in combination with the other references cited in the office action.

Dependent claims 2-18, 20, 22, 24-28 and 30-42 depend directly or indirectly from independent claims 1, 21, 23 and 29, and thus contain all of the limitations of the independent claims from which they depend. Therefore, these dependent claims are patentable over Fossey and the other cited references, either alone or in combination, for at least the reasons set forth above with respect to claims 1, 21, 23 and 29.

The Examiner requests clarification regarding the type of claim Applicant has created regarding claim 7. Applicant has amended claim 7 to more clearly identify the claimed subject matter. Applicant submits that claim 7 recites additional structure further defining the active area of the blade recited in claim 1 and is now in condition for allowance.

The examiner has requested an amendment to claim 27 to further define the claimed subject matter as a method step. Applicant has amended claim 27 in a manner substantially similar to the Examiner's suggestion and submits that claim 27 is now in condition for allowance.

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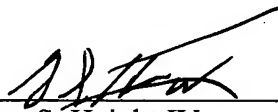
CONCLUSION

For at least the reasons outlined above, Applicant submits that all of the claims are now in condition for allowance and requests reconsideration. Please apply any charges or credits to Deposit Account No. 50-1721.

Respectfully submitted,

Date: August 27, 2007
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